16. (New) The method of claim 13, wherein the negative type photosensitive conductive material comprises at least one coloring agent.

17. (New) A method of making a flat panel display comprising the method of claim 13 for making the active matrix substrate of the flat panel display.

18. (New) A method of making a flat panel image sensing device comprising the method of claim 13 for making the active matrix substrate thereof.

## REMARKS

This is in response to the Office Action dated March 21, 2003. Claim 6 has been canceled. New claims 9-18 have been added. Thus, claims 1-5 and 7-18 are now pending. Applicant affirms the election of Species I (i.e., flat panel display device). Attached hereto is a marked-up version of the changes made to the abstract and claim(s) by the current amendment. The attached page(s) is captioned "Version With Markings To Show Changes Made."

A new title and changes to the abstract have been provided herein as suggested by the Examiner.

### General

For purposes of example, and without limitation, certain embodiments of this invention relate to an active matrix substrate for use in an LCD or the like which includes pixel electrodes formed of photosensitive conductive material that is photo-patternable.

Example photo-patterning is discussed at pg. 17, lines 3-10. This allows the process of manufacture to be made shorter, exposure precision to be improved by self alignment, and leakage failures to be reduced between pixel electrodes. Moreover, in certain embodiments, the pixel electrode may also include coloring agent(s) so that the pixel electrode can function as both a pixel electrode and a color filter, thereby eliminating the need for separate and distinct color filters (e.g., pg. 11, lines 16-24; and pg. 24, line 8 to pg. 25, line 25). The combination of a pixel electrode which is both photo-patternable and acts as a color filter(s) is clearly advantageous with respect to reducing processing times, improving yields, and/or reducing the number of layers required.

Furthermore, in certain example embodiments, the photosensitive conductive material of the pixel electrodes has *negative* type photosensitivity. This is significant, especially when used in a transmissive type device. This is because of the following two effects obtained by exposing (e.g., via IR rays) the negative type material from a back side of a light permeable substrate. First, dispersion of parasitic capacitance, which is generated in a superposed portion (e.g., see Fig. 3C) of the pixel electrode 1 and gate line/source line, can be substantially uniformed in the entire pixel area; this is because the exposure is performed in self-alignment by using the gate and/or source line(s) as exposure masks (e.g., pg. 22, lines 4-22). Second, short-circuits between the pixel electrodes can be avoided. This is because, unlike the case of mask exposure of a conventional positive type photoresist, there is not generated in an unexposed portion a conductive film due to the presence of dust between pixel electrodes (e.g., pg. 22, line 23 to pg. 23, line 9). Thus, it can be seen that the use of a negative type photosensitive

material is particularly beneficial for several reasons when used in a device such as a transmissive LCD.

Claim 1

Claim 1 stands rejected under 35 U.S.C. Section 102(e) as being allegedly anticipated by Nakai. This Section 102(e) rejection is respectfully traversed for at least the following reasons.

Claim 1 requires that "pixel electrodes are comprised of a photosensitive conductive material including at least one coloring agent so that at least some of the pixel electrodes function as both pixel electrodes and color filters." E.g., see original claim 6, as well as the instant specification at pg. 11, lines 16-24; and pg. 24, line 8 to pg. 25, line 25. The combination of a pixel electrode which is both photo-patternable and acts as a color filter(s) is clearly advantageous with respect to reducing processing times, improving yields, and/or reducing the number of layers required. The cited art fails to disclose or suggest the aforesaid underlined aspect of claim 1.

Nakai fails to disclose or suggest a photosensitive pixel electrode which includes at least one coloring agent so as to function as both a pixel electrode and a color filter. The portion of Nakai relied upon by the Office Action (col. 14, lines 29-30) is entirely unrelated to pixel electrodes, and relates only to an embodiment of Nakai where the pixel electrode is of ITO (see col. 12, lines 24-25). The coloration discussed at col. 14, lines 29-30 is not directed toward pixel electrodes; instead, this coloration relates to the light-condensing region 1. The only embodiment of Nakai where a photosensitive material is used for a pixel electrode does not disclose or suggest coloration of the pixel electrode

(see col. 15, lines 15-49). Nakai fails to disclose or suggest coloring a photo-patternable pixel electrode.

It would not have been obvious to have colored the photosensitive material mentioned as col. 15, lines 44-49 of Nakai. Nothing in the art suggests this. Hindsight is impermissible.

Claim 9

Claim 9 requires that "the pixel electrode comprises a photosensitive conductive material and at least one coloring agent so that the pixel electrode functions as both a pixel electrode and a color filter, and wherein the pixel electrode is photo-patternable due to its photosensitive nature." Again, the cited art fails to disclose or suggest this aspect of claim 9.

Claim 11

Claim 11 calls for a "transmissive liquid crystal display including a liquid crystal cell which comprises . . . . a transparent pixel electrode in electrical communication with the switching element, wherein the transparent pixel electrode is for applying voltage across a liquid crystal layer; wherein the transparent pixel electrode comprises a negative type photosensitive conductive material and is photo-patternable due to its photosensitive nature; and wherein no reflector is provided in the liquid crystal cell under the pixel electrode, so that the liquid crystal display is of the transmissive type." Nakai teaches directly away from claim 11. In particular, the goal and purpose of Nakai is to provide a reflective LCD which utilizes reflector 5 under the pixel electrode. One of ordinary skill

in the art would never have modified Nakai to meet the transmissive type display of claim 11, because this would destroy the purpose and goal of Nakai.

Moreover, Nakai also fails to disclose or suggest the "negative" type of photosensitive material called for in claim 11. The use of a "negative" type photosensitive material for the pixel electrode is very important, especially when used in a transmissive type display. This is because of the following two effects obtained by exposing (e.g., via IR rays) the negative type material from a back side of a light permeable substrate. First, dispersion of parasitic capacitance, which is generated in a superposed portion (e.g., see Fig. 3C) of the pixel electrode 1 and gate line/source line, can be substantially uniformed in the entire pixel area; this is because the exposure is performed in self-alignment by using the gate and/or source line(s) as exposure masks (e.g., pg. 22, lines 4-22). Second, short-circuits between the pixel electrodes can be avoided. This is because, unlike the case of mask exposure of a conventional positive type photoresist, there is not generated in an unexposed portion a conductive film due to the presence of dust between pixel electrodes (e.g., pg. 22, line 23 to pg. 23, line 9). Thus, it can be seen that the use of a negative type photosensitive material is particularly beneficial for several reasons when used in a device such as a transmissive LCD.

The cited art fails to disclose or suggest using a "negative" type photo-patternable material for a pixel electrode in a transmissive type display. Nakai teaches directly to the contrary by (a) not disclosing or suggesting a "negative" type material, and (b) requiring a reflective, as opposed to a transmissive, type display.

Claim 13

Claim 13 requires "performing *exposure from a back surface side of the light permeable substrate* in order to expose the *negative* type photosensitive transparent conductive material in a self-alignment fashion by using the gate signal lines and the source signal lines as exposure masks; developing the negative type photosensitive transparent conductive material so as to obtain *pixel electrodes* by removing unexposed parts of the negative type photosensitive transparent conductive material." The cited art fails to disclose or suggest the invention of claim 13.

As explained above, the use of a "negative" type photosensitive material for the pixel electrode is very important, especially when used in a transmissive type display. This is because of the following two effects obtained by exposing (e.g., via IR rays) the *negative type material from a back side of a light permeable substrate*. First, dispersion of parasitic capacitance, which is generated in a superposed portion (e.g., see Fig. 3C) of the pixel electrode 1 and gate line/source line, can be substantially uniformed in the entire pixel area; this is because the exposure is performed in self-alignment by using the gate and/or source line(s) as exposure masks (e.g., pg. 22, lines 4-22). Second, short-circuits between the pixel electrodes can be avoided. This is because, unlike the case of mask exposure of a conventional positive type photoresist, there is not generated in an unexposed portion a conductive film due to the presence of dust between pixel electrodes (e.g., pg. 22, line 23 to pg. 23, line 9).

Nakai cannot possibly expose from the back side due to the presence of reflector 5. Moreover, Nakai also fails to disclose or suggest the claimed "negative" material.

Furthermore, the example advantages discussed above cannot possibly be realized by Nakai. Nakai is entirely unrelated to the invention of claim 13.

For at least the foregoing reasons, it is respectfully requested that all rejections be withdrawn. All claims are in condition for allowance. If any minor matter remains to be resolved, the examiner is invited to telephone the undersigned with regard to the same.

Respectfully submitted,

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

## IN THE ABSTRACT

ABSTRACT OF THE DISCLOSURE

There is provided an active matrix substrate which [enables to shorten]allows for a shorter fabrication process of a pixel electrode, improved exposure precision by self alignment, and prevention of leakage failures between pixel electrodes. [The active matrix substrate has TFTs disposed in the shape of a matrix. On a light permeable substrate, there are formed gate signal lines and capacity lines. On a gate insulating film on the lines, there are formed in sequence a semiconductor layer, a source electrode and a drain electrode separated right and left by a channel protection layer. Thus, the TFTs are fabricated. Then, the entire substrate is covered with an interlayer insulating film. On top of the interlayer insulating film, there are formed pixel electrodes, which are connected to the TFTs through contact holes piercing through the interlayer insulating film.] The pixel electrodes are formed by applying on the interlayer insulating film a photosensitive transparent resin such as negative acrylic polymerized resin containing ITO, ATO or ZnO as transparent conductive particles, performing exposure from the back side of the substrate, and conducting development. In certain embodiments, the pixel electrodes may function as both pixel electrodes and color filters in a display such as an LCD.

**IN THE CLAIMS**

Please cancel claim 6.

1. (Amended) An active matrix substrate comprising:

switching elements disposed in a shape of a matrix;

gate signal lines controlling the switching elements;

source signal lines connected to the switching elements and formed orthogonal to the gate signal lines;

an interlayer insulating film formed on the switching elements, the gate signal lines, and the source signal lines; and

pixel electrodes formed [on]over at least the interlayer insulating film and [connected to the]in electrical communication with respective switching elements through contact holes [piercing through]defined in the interlayer insulating film,

wherein the pixel electrodes are [made from]comprised of a photosensitive conductive material including at least one coloring agent so that at least some of the pixel electrodes function as both pixel electrodes and color filters.

Please add the following new claims:

9. (New) A liquid crystal display comprising:

a substrate supporting a plurality of address lines in communication with a switching element;

a pixel electrode in electrical communication with the switching element, wherein the pixel electrode is for applying voltage across a liquid crystal layer; and

wherein the pixel electrode comprises a photosensitive conductive material and at least one coloring agent so that the pixel electrode functions as both a pixel electrode and a color filter, and wherein the pixel electrode is photo-patternable due to its photosensitive nature.

10. (New) The liquid crystal display of claim 9, wherein the photosensitive conductive material of the pixel electrode has negative type photosensitivity.

11. (New) A transmissive liquid crystal display including a liquid crystal cell which comprises:

a substrate supporting a plurality of address lines in communication with a switching element;

a transparent pixel electrode in electrical communication with the switching element, wherein the transparent pixel electrode is for applying voltage across a liquid crystal layer;

wherein the transparent pixel electrode comprises a negative type photosensitive conductive material and is photo-patternable due to its photosensitive nature; and

wherein no reflector is provided in the liquid crystal cell under the pixel electrode, so that the liquid crystal display is of the transmissive type.

12. (New) The liquid crystal display of claim 11, wherein the photosensitive conductive material of the pixel electrode also acts as a color filter.

13. (New) A method of making an active matrix substrate, the method comprising:

forming switching elements disposed in a shape of a matrix, gate signal lines controlling the switching elements and extending in a first direction, and source signal lines connected to the switching elements and extending in a second direction perpendicular to the first direction on a front surface of a light permeable substrate;

forming an interlayer insulating film on the switching elements, the gate signal lines, and the source signal lines;

forming on the interlayer insulating film a negative type photosensitive transparent conductive material whose exposed parts are left in a pattern;

performing exposure from a back surface side of the light permeable substrate in order to expose the negative type photosensitive transparent conductive material in a self-alignment fashion by using the gate signal lines and the source signal lines as exposure masks;

developing the negative type photosensitive transparent conductive material so as to obtain pixel electrodes by removing unexposed parts of the negative type photosensitive transparent conductive material.

14. (New) The method of claim 13, wherein the negative type photosensitive conductive material comprises photosensitive resin and conductive particles dispersed in the photosensitive resin.

15. (New) The method of claim 14, wherein the conductive particles comprise indium tin oxide, antimony tin oxide, or zinc oxide.

16. (New) The method of claim 13, wherein the negative type photosensitive conductive material comprises at least one coloring agent.

17. (New) A method of making a flat panel display comprising the method of claim 13 for making the active matrix substrate of the flat panel display.

18. (New) A method of making a flat panel image sensing device comprising the method of claim 13 for making the active matrix substrate thereof.